

*AMENDMENTS TO THE CLAIMS*

This listing of claims replaces all prior versions, and listings, of claims in the application.

1. (Canceled)

2. (Currently Amended) A control-program-development supporting apparatus that develops a control program described with a sequential-control language, said control-program-development supporting apparatus comprising:

a compiler which compiles the control program into codes directly executable by a microprocessor that includes ~~an acceleration unit~~ at least one cache; and

an optimization filtering unit which reconstructs the control program into an optimum code system by excluding not-cited variables and redundant codes, recombining logical operations, and rearranging codes for locally arranging instructions for a common input or output device, wherein a control program optimized by said optimization filtering unit is newly used as the control program.

3. (Canceled)

4. (Currently Amended) ~~The A~~ A control-program-development supporting apparatus ~~according to claim 2~~ that develops a control program described with a sequential-control language, further said control-program-development supporting apparatus comprising:

a compiler which compiles the control program into codes directly executable by a microprocessor that includes at least one cache, and

a processing-time rough-estimating unit which has a relating table which relates a sample program programs having a known processing time times with the control program corresponding to the execution codes to estimate sequential-processing execution time of a programmable controller in accordance with the relating table, wherein the processing-time rough-estimating unit determines and selects the sample program most similar to the control program to estimate processing time.

5. (Currently Amended) A control-program-development supporting apparatus that develops a control program described with a sequential-control language, said control-program-development supporting apparatus comprising:

a control-program dividing unit which divides the control program into a plurality of controllable blocks; and

a compiler which compiles at least some of the controllable blocks into execution codes directly executable by a programmable controller, wherein the programmable controller includes a microprocessor having ~~an acceleration unit~~ at least one cache.

6. (Canceled)

7. (Currently Amended) The control-program-development supporting apparatus according to claim 5, wherein the control program is a ladder diagram or an instruction list generated from the ladder diagram, and the control-program dividing unit divides the control program into a plurality of controllable blocks at a predetermined rung in the ladder diagram to generate a program file for every controllable block concerned.

8. (Currently Amended) The control-program-development supporting apparatus according to claim 5, wherein the control program is a ladder diagram or an instruction list generated from the ladder diagram, and the control-program dividing unit divides the control program into a plurality of controllable blocks at a predetermined rung serving as a jump destination for a jump instruction in the ladder diagram to generate a program file for every controllable block.

9. (Currently Amended) The control-program-development supporting apparatus according to claim 5, wherein

the control program is a ladder diagram or an instruction list generated from the ladder diagram, and

the control-program dividing unit extracts at least some rungs including instructions to a common input or output device from the ladder diagram, at least some of the rungs extracted constituting one controllable block, and generates a program file for every controllable block.

10. (Currently Amended) The control-program-development supporting apparatus according to claim 5 further comprising an optimization filtering unit which reconstructs the control program into an optimum code system by excluding not-cited variables and redundant codes, recombining logical operations, and rearranging codes for locally arranging instructions for a common input or output device, wherein a control program optimized by said optimization filtering unit is newly used as the control program.

11. (Currently Amended) The control-program-development supporting apparatus according to claim 5, further comprising a processing-time rough-estimating unit which has a relating table which relates ~~a~~ sample program having ~~a~~ known processing ~~time~~times with the control program corresponding to the execution codes to estimate a sequential-processing execution time of a programmable controller in accordance with the relating table, wherein the processing-time rough-estimating unit determines and selects the sample program most similar to the control program to estimate processing time.

12. (Currently Amended) A control-program-development supporting apparatus that develops a control program described with a sequential-control language, said control-program-development supporting apparatus comprising:

a control-program dividing unit which divides the control program into a plurality of controllable blocks;

a control-program converting unit which converts at least some of the controllable blocks into high-level-language control programs described with a ~~universal~~-computer-readable high-level language for every controllable block; and

a compiler which compiles at least some of ~~universal~~-computer-readable high-level programming languages corresponding to every controllable block into codes directly executable by a programmable controller.

13. (Canceled)

14. (Currently Amended) The control-program-development supporting apparatus according to claim 12, wherein

the control program is a ladder diagram or an instruction list generated from the ladder diagram, and

the control-program dividing unit divides the control program into a plurality of controllable blocks at a predetermined rung in the ladder diagram to generate a program file for every controllable block.

15. (Currently Amended) The control-program-development supporting apparatus according to claim 12, wherein the control program is a ladder diagram or an instruction list generated from the ladder diagram, and the control-program dividing unit divides the control program into a plurality of controllable blocks at a predetermined rung, serving as a jump

destination for a jump instruction in the ladder diagram, to generate a program file for every controllable block.

16. (Currently Amended) The control-program-development supporting apparatus according to claim 12, wherein

the control program is a ladder diagram or an instruction list generated from the ladder diagram, and

the control-program dividing unit extracts at least some of rungs including instructions to a common input or output device from the ladder diagram, constituting one controllable block of at least some of the extracted rungs, and generates a program file for every controllable block.

17. (Currently Amended) The control-program-development supporting apparatus according to claim 12 further comprising an optimization filtering unit which reconstructs the control program into an optimum code system by excluding not-cited variables and redundant codes, recombining logical operations, and rearranging codes for locally arranging instructions for a common input or output device, wherein a control program optimized by said optimization filtering unit is newly used as the control program.

18. (Currently Amended) The control-program-development supporting apparatus according to claim 12, further comprising a processing-time rough-estimating unit which has a relating table which relates ~~a sample program~~ programs having ~~the processing time~~ times already known with the control program corresponding to the execution codes to estimate a sequential-processing execution time of a programmable controller in accordance with the relating table, wherein the processing-time rough-estimating unit determines and selects the sample program most similar to the control program to estimate processing time.

19. (Currently Amended) A control-program-development supporting apparatus that develops a control program described with a sequential-control language, said control-program-development supporting apparatus comprising:

a control-program converting unit which converts the control program into a high-level-programming-language control program described with a ~~universal~~ computer-readable high-level programming language;

a debugging-code generating unit which generates a debugging control program by inserting a line number into a part corresponding to each line, constituting the instruction list in source codes, constituting the high-level-programming-language control program; and

a debugging executing unit which displays each line of the instruction list and the execution part of the high-level-programming-language control program by relating the former with the latter.

20-25. (Canceled)

26. (Currently Amended) A programmable controller that performs sequential processing in accordance with execution codes generated by compiling a control program, said programmable controller comprising:

a storing unit which stores the execution codes;

a microprocessor including ~~an acceleration mounting unit~~ at least one cache and directly executing the execution codes; and

a control-program-development supporting apparatus that develops a control program described with a sequential-control language, the control-program-development supporting apparatus having,

a control-program dividing unit which divides the control program into a plurality of controllable blocks; and

a compiler which compiles at least some of the controllable blocks into execution codes directly executable by a programmable controller.

27. (Currently Amended) A programmable controller that performs sequential processing in accordance with execution codes generated by compiling a control program, said programmable controller comprising:

a storing unit which stores the execution codes;

a microprocessor including ~~an acceleration mounting unit~~ at least one cache and directly executing the execution codes; and

a control-program-development supporting apparatus that develops a control program, described with a sequential-control language, the control-program-development supporting apparatus having,

a control-program dividing unit which divides the control-program into a plurality of controllable blocks;

a control-program converting unit which converts at least some of the controllable blocks into high-level-language control programs described with a ~~universal~~ computer-readable high-level language for every controllable block; and

a compiler which compiles at least some of ~~universal~~ computer-readable high-level programming languages corresponding to every controllable block into codes directly executable by a programmable controller.

28. (Currently Amended) A programmable controller that performs sequential processing in accordance with execution codes generated by compiling a control program, said programmable controller comprising:

a storing unit which stores the execution codes;

a microprocessor including ~~an acceleration mounting unit~~ at least one cache and directly executing the execution codes; and

a control-program-development supporting apparatus that develops a control program described with a sequential-control language, the control-program-development supporting apparatus having;

a control-program converting unit which converts the control program into a high-level-programming-language control program described with a ~~universal~~ computer-readable high-level programming language;

a debugging-code generating unit which generates a debugging control program by inserting a line number into a part corresponding to each line constituting the instruction list, in source codes constituting the high-level-programming-language control program; and

a debugging executing unit which displays each line of the instruction list and the execution part of the high-level-programming-language control program by relating the former with the latter.

29-37. (Canceled)